31. (Twice Amended) A method for polishing a semiconductor wafer, wherein a finish polishing is performed while a concentration of zinc oxide (ZnO) is kept to 200ppm or less in a position where the semiconductor wafer is in contact with a polishing pad.

REMARKS

Claims 11-18 and 20-31 are pending herein. By this Amendment, claims 11-13, 17, 18, 20, 21 and 27-31 are amended.

The attached Appendix includes marked-up copies of each rewritten claim (37 C.F.R. §1.121(c)(1)(ii)).

In particular, claims 11-13, 17, 18, 20, 21 and 31 are amended to replace the term "zinc compounds" with "zinc oxide (ZnO)." Such claim amendments more fully define the present invention, and better distinguish the present invention over the teachings of U.S. Patent No. 6,217,434 (hereinafter Roberts).

In addition, claims 27-30 are amended to address the rejection of these claims under 35 U.S.C. §112, second paragraph.

No new matter is added by this Amendment. Support for the amendments to the claims changing the term "zinc compounds" to "zinc oxide (ZnO)" is found throughout the present specification. For example, at page 14, lines 14-18 of the present specification describes that "These contaminants were identified by Energy Dispersive X-ray Spectroscopy (abbreviated name, EDX), as the result, zinc (Zn) and oxygen (O) were detected, and it was found that these contaminants were zinc compounds." (Emphasis added). Further, it is described at page 15, lines 11-12, that "This zinc compound is mainly composed of zinc oxide (ZnO), and its grain diameter is about 500 nm to 1,000 nm." (Emphasis added). Thus, the amendments do not constitute new matter and are supported by the present specification.

Further, the claim amendments do not raise any new issues requiring further consideration and/or search. Specifically, since the amendments merely limit a compound to

the specific substance making up the compound as defined in the specification, the claim amendments do not change the meaning of the claims. Accordingly, in view of the meaning given in the present specification for the term "zinc compounds," the scope of the present claims must have already been examined by the Examiner and therefore such amendments should not be found to raise any new issues requiring further consideration and/or search.

Accordingly, entry and consideration of the foregoing claim amendments are respectfully requested.

## I. Rejection Under 35 U.S.C. §112, second paragraph

Claims 27-30 were rejected under 35 U.S.C. §112, second paragraph as allegedly being indefinite. In particular, it was alleged that the language of these method claims was not clear.

By this Amendment, each of claims 27-30 has been amended to clarify the method steps undertaken in the process, and to clarify that in such process, the polishing pad is that of a referenced claim. Applicants respectfully submit that the claims as amended are clear and definite in accordance with not only the process involved, but also the polishing pad employed in the process.

For at least the foregoing reasons, reconsideration and withdrawal of this rejection are respectfully requested.

## II. Rejection Under 35 U.S.C. §103(a)

Claims 11-31 were rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Roberts in view of Applicants' admitted prior art. This rejection is respectfully traversed.

Roberts, either alone or in conjunction with the alleged admitted prior art, would not have led one of ordinary skill in the art to the presently claimed invention. Roberts describes polishing pads for the manufacture of semiconductor devices. Roberts teaches that the

polishing pads comprise a random surface topography and may be formed by a process of reaction injection molding.

However, the polishing pad according to claim 11 of the present application is characterized in that a content of zinc oxide (ZnO) included in the polishing pad is 200ppm or less at the ratio of zinc weight relative to the weight of the polishing pad. The reason for limiting the content of zinc oxide included in the polishing pad is described in detail in the present specification. For example, as described at page 14, line 9 to page 16, line 15 of the present specification, the present inventors found that minute polishing damages were generated by using a conventional finished polishing pad in a mirror-polishing process of a semiconductor wafer, and further found that such polishing damages were caused by zinc compounds, in particular ZnO, which were added to a polishing pad for increasing hardness of a nonwoven fabric constituting the polishing pad or added to a polishing pad formed of urethane resin as a stabilizer against light in a manufacturing step of urethane resin, and as a result accomplished the present invention.

In sections 4 and 6 of the Office Action, the Patent Office points out that Roberts teaches that a preferred catalyst used for decreasing the polymerization reaction time of urethane constituting the polishing pad is devoid of transition metals, particularly zinc, etc., and that Roberts does not teach the use of zinc compounds as fillers to increase hardness or as a stabilizer against light. Therefore, the Patent Office concludes that "if there is no zinc, there is no ZnO" (page 4, line 4 of the Office Action).

However, Applicants respectfully submit that the polishing pad of the present invention cannot be derived from the teachings of Roberts, either considered alone or in conjunction with the allegedly admitted prior art.

As pointed out by the Patent Office, Roberts teaches, for example at col. 5, line 62 to col. 6, line 6, that a preferred catalyst to decrease the polymerization reaction time is devoid

of transition metals, particularly zinc and the like. Based on such a teaching, one of ordinary skill in the art might produce a urethane polishing pad in which zinc metal is not used as a polymerization catalyst in forming the urethane, and hence zinc metal may not be present in the thus produced urethane material of the polishing pad.

However, non-use of zinc metal as a polymerization catalyst in the teachings of Roberts is completely different from non-use of zinc oxide that is conventionally used for increasing hardness of a polishing pad or used as a stabilizer against light. Mainly, although Roberts teaches that urethane or the like, which is polymerized by a catalyst other than zinc, is used as a matrix of a polishing pad, Roberts neither teaches nor suggests that the content of zinc oxide used for a hardening agent or a stabilizer against light should be limited.

Moreover, although Roberts does not specify the reason for avoiding metal such as zinc in a polymerization catalyst, it appears from the description at col. 5, line 62 to col. 6, line 2 of Roberts that the reason may be to prevent too fast a polymerization reaction time in forming the urethane. Regardless, nowhere does Roberts teach or suggest that zinc added as a polymerization catalyst to a polishing pad may form zinc oxide, which the present inventors alone have discovered becomes a cause of generation of minute polishing damages for a wafer. Nowhere does Roberts teach or suggest that the presence of zinc oxide must be avoided as in the presently claimed invention.

Therefore, even if one of ordinary skill in the art were to have avoided the use of zinc in a polymerization catalyst for making urethane constituting a polishing pad in accordance with the teachings of Roberts, such would not have led to one of ordinary skill in the art to avoid the use of zinc oxide, which is conventionally used as a hardening agent or as a stabilizer against light in a polishing pad. Thus, it is impossible to conclude that "if there is no zinc, there is no ZnO" in view of the teachings of Roberts that merely teach that the use of zinc as a polymerization catalyst should be avoided.

In section 6 of the Office Action, mainly on page 4, lines 10-12 of the Office Action, the Patent Office asserted that per Applicants' argument that zinc compound is "often" used in making the pad, there are pads made (those not covered by "often") that do not use zinc compounds and thus meet the claim limitations in the present claims.

On page 6, lines 11-14 of the previous response, Applicants asserted that "it would not have been obvious from Roberts' disclosure that zinc metal is preferably not present in the catalyst or making polishing pads, to conclude that zinc compounds, often used as fillers in such polishing pads, should be absent or present in very small amounts in a polishing pad." (Emphasis added). However, in this regard, "often" was merely used so as not to limit zinc compounds contained in a polishing pad to "fillers," and therefore Applicants have never admitted that any conventional polishing pads for mirror-polishing semiconductor wafers did not contain zinc compounds. For example, as described on page 15 of the present specification, zinc compounds are added to a polishing pad not only for increasing its hardness (as filler), but also as a stabilizer against light. Also, as clear from the description on page 15, lines 9-10 of the present specification that "conventional polishing pads investigated this time included zinc compounds of several hundred ppm," (emphasis added), and the description on page 29, lines 13-18 of the present specification that "the content of zinc compounds in a surface layer of conventionally used polishing pads is generally about 300-800 ppm at the ratio of zinc weight relative to the weight of the surface layer of the polishing pad, or 1,000 ppm or more in the case of a plenty one," (emphasis added), the Applicants have already confirmed that conventional polishing pads contained zinc compounds of 300 ppm or more at the ratio of zinc weight relative to the weight of the polishing pad. Therefore, the polishing pad according to claim 11 of the present application reciting that "a content of zinc oxide (ZnO) included in the polishing pad is 200 ppm or less

at the ratio of zinc weight relative to the weight of the polishing pad" can be clearly distinguished from conventional polishing pads.

As explained above, Roberts only teaches that the use of zinc in a polymerization catalyst should be avoided. Roberts never teaches that zinc compounds, which are conventionally used for increasing hardness or as a stabilizer against light in semiconductor wafer polishing pads should be avoided. On the other hand, conventional polishing pads contain zinc oxide in amounts of 300 ppm or more at the ratio of zinc weight relative to the weight of the polishing pad as confirmed by Applicants in the present application. Accordingly, at best there is only derived from the teachings of Roberts and the allegedly admitted prior art that a polishing pad in which zinc is not contained in a polymerization catalyst would still contain zinc oxides in amounts of 300 ppm or more at the ratio of zinc weight relative to the weight of the polishing pad as a result of such zinc oxides being present as a stabilizer against light, etc. The polishing pad of claim 11 thus clearly patentably distinguishes over the teachings of Roberts, considered alone or in combination with the allegedly admitted prior art.

Finally, for all the same reasons set forth above, the polishing pads according to claims 12-18 and 20-26, which substantially further limit the content of zinc oxides, the polishing method according to claims 27-30 utilizing such polishing pads, and the method of claim 31 wherein a finish polishing is performed while keeping a concentration of zinc oxides to 200 ppm or less so as to have the same effect as the above method claims, are also patentably distinguishable from the teachings relied upon by the Patent Office.

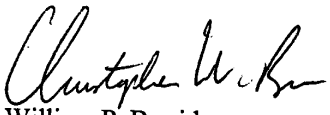
For at least the foregoing reasons, Applicants respectfully submit that neither Roberts alone nor considered together with the teachings of the allegedly admitted prior art would have led one of ordinary skill in the art to the presently claimed invention. Reconsideration and withdrawal of this rejection are respectfully requested.

## III. Conclusion

In view of the foregoing amendments and remarks, Applicants respectfully submit that claims 11-18 and 20-31 are in condition for allowance.

Should the Examiner believe that anything further would be desirable in order to place this application in better condition for allowance, the Examiner is invited to contact Applicants' undersigned representative at the telephone number set forth below.

Respectfully submitted,



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WPB:CWB/rxg

Attachment:
Appendix

Date: October 28, 2002

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**P.O. Box 19928**
**Alexandria, Virginia 22320**
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DEPOSIT ACCOUNT USE AUTHORIZATION
Please grant any extension necessary for entry;
Charge any fee due to our Deposit Account No. 15-0461

APPENDIX

Changes to Claims:

The following are marked-up versions of the amended claims:

11. (Amended) A polishing pad used for polishing a semiconductor wafer in a mirror polishing process, wherein a content of zinc oxide (ZnO)~~compounds~~ included in the polishing pad is 200ppm or less at the ratio of zinc weight relative to the weight of the polishing pad.

12. (Amended) A polishing pad used for polishing a semiconductor wafer in a finish polishing process, wherein a content of zinc oxide (ZnO)~~compounds~~ included in the polishing pad is 100ppm or less at the ratio of zinc weight relative to the weight of the polishing pad.

13. (Amended) A polishing pad used for polishing a semiconductor wafer in a finish polishing, wherein the polishing pad does not include zinc oxide (ZnO)~~compounds~~.

17. (Twice Amended) The polishing pad used for polishing a semiconductor wafer according to Claim 14, wherein a content of zinc oxide (ZnO)~~compounds~~ in the porous surface layer is 100ppm or less at the ratio of zinc weight relative to the weight of the porous surface layer.

18. (Twice Amended) The polishing pad used for polishing a semiconductor wafer according to Claim 15, wherein a content of zinc oxide (ZnO)~~compounds~~ in the porous surface layer is 100ppm or less at the ratio of zinc weight relative to the weight of the porous surface layer.

20. (Twice Amended) A polishing pad used for polishing a semiconductor in a mirror polishing process, wherein it ~~is~~ comprises a base layer formed of nonwoven fabric and a porous surface layer, and a content of zinc oxide (ZnO)~~compounds~~ included in the porous

surface layer is 100ppm or less at the ratio of zinc weight relative to the weight of the porous surface layer.

21. (Twice Amended) The polishing pad for polishing a semiconductor wafer according to claim 20, wherein the porous surface layer does not include zinc oxide (ZnO)~~compounds~~.

27. (Twice Amended) A method for polishing a semiconductor wafer, comprising performing ~~wherein the~~ polishing of the semiconductor wafer~~is performed by using~~ with the polishing pad of~~according to~~ Claim 11.

28. (Twice Amended) A method for polishing a semiconductor wafer, comprising performing ~~wherein the~~ polishing of the semiconductor wafer~~is performed by using~~ with the polishing pad of~~according to~~ Claim 12.

29. (Twice Amended) A method for polishing a semiconductor wafer, comprising performing ~~wherein the~~ polishing of the semiconductor wafer~~is performed by using~~ with the polishing pad of~~according to~~ Claim 13.

30. (Amended) A method for polishing a semiconductor wafer, comprising performing ~~wherein the~~ polishing of the semiconductor wafer~~is performed by using~~ with the polishing pad of~~according to~~ Claim 20.

31. (Twice Amended) A method for polishing a semiconductor wafer, wherein a finish polishing is performed while a concentration of zinc oxide (ZnO)~~compounds~~ is kept to 200ppm or less in a position where the semiconductor wafer is in contact with a polishing pad.